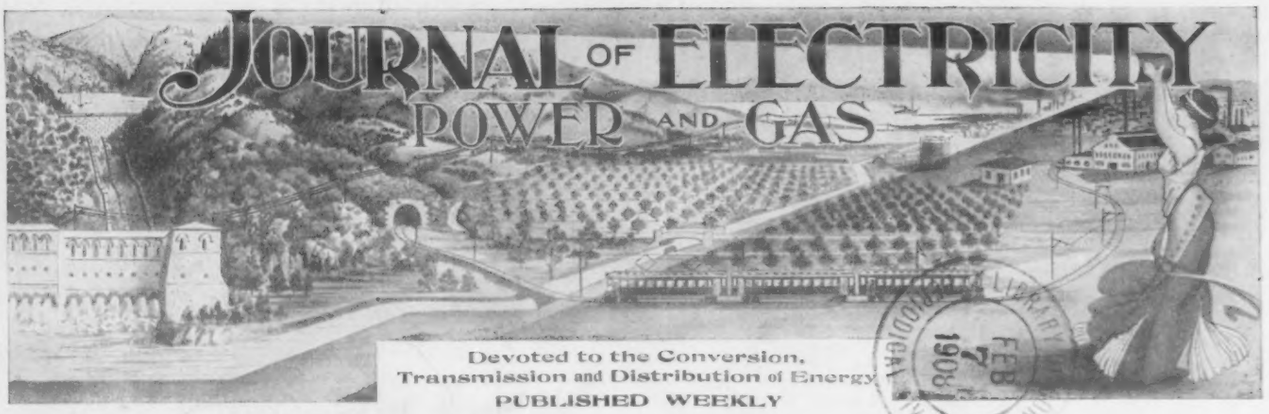

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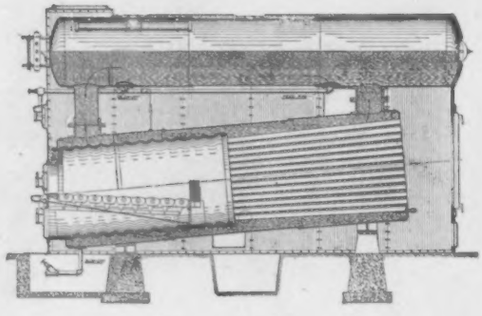

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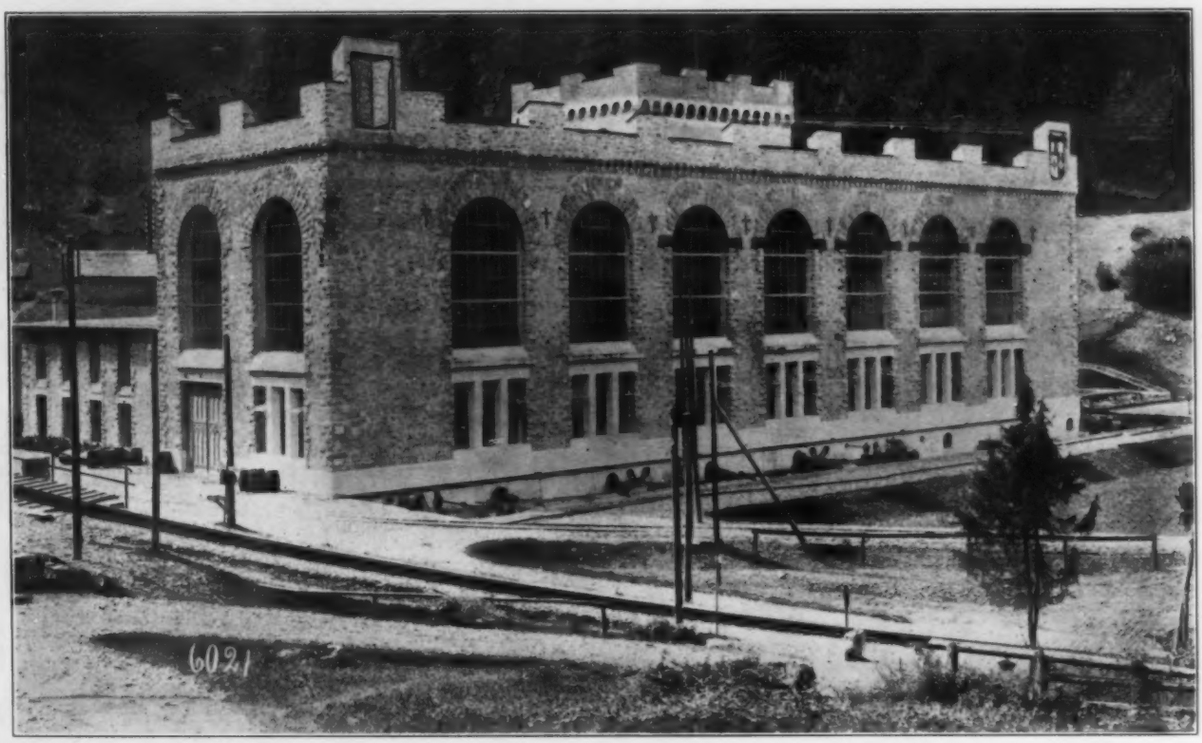
The Engineers', Architects' and Builders' News

VOLUME XX. SAN FRANCISCO, CAL., FEBRUARY 1, 1908 No. 5

THE OBERMATT HYDRO-ELECTRIC POWER PLANT.

One of the most thoroughly up-to-date electric power transmission systems in Switzerland is that supplied with current from the Obermatt hydro-electric station, near Luzern. This modern electric power transmission equipment cost more than a million dollars, the electrical part costing nearly two million francs, the remainder being expended for land, buildings and hydraulic construction. The city of Luzern supplied about nine-tenths of the capital required by the Elektrizitatswerk Luzern-Engelberg A.-G. The accompanying illustrations and drawings show the details of construction, the hydraulic and electrical equipment of the power station in Obermatt, near Engelberg, as well as the electrical connections and equipment of the sub-stations at Luzern, Steghof and Kriens, together with the transmission line supplying current from the Obermatt power house.



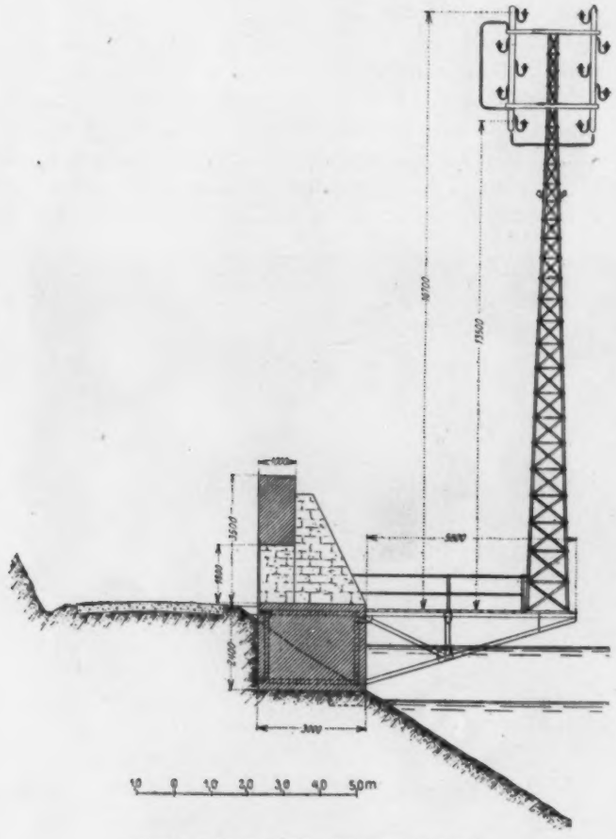
OBERMATT CENTRAL POWER STATION

The water is carried from the river Erlenbach, near Engelberg, into a natural reservoir, near that city, having an area of twenty-two thousand square meters and a capacity of seventy thousand cubic meters. This natural reservoir is 990.8 meters above the sea level, and has a depth of three and a half meters. The crown of the dam is half a meter above the high-water mark, and an overflow race has been provided ten meters wide. The water is conducted from this natural reservoir through a cement conduit a distance of 2,558.6 meters, the cross-section being 4.15 square meters. The total fall from the reservoir to the entrance of the penstocks at the Obermatt power plant is 3.06 meters, or 1.2 per cent gradient, while the fall through the penstocks to the water wheels is three hundred meters.

The concrete conduit from the reservoir was constructed in four sections, 458.84 meters, 781.8 meters, 650.5 meters and 667.46 meters in length. There are two penstocks installed, with provision for two additional ones at the "Wasserschloss," the entrance to these penstocks being 2.1 meters from center to center. They are arranged in four sections, the one nearest the Obermatt power house having a grade of 28.658 per cent, and being about 55 meters long, the next having a gradient of 61.968 per cent, its length being about 125 meters long, while

the third section has a length of 160 meters, the grade being 82 per cent. The highest section of these penstocks has a gradient of 60.39 per cent and measures 240 meters in length. The water is conducted to two turbines by each pipe at the rate of 1.33 cubic meters per second as a maximum. The thickness of the steel pipes being twenty-five millimeters.

The hydraulic equipment was installed by Theodor Bell & Cie, of Kriens, and the Gebruder Sulzer, of Winterthur, Switzerland. The pipes furnished by the latter firm for the penstocks are anchored at various points along the four sections, each of which terminate in substantial concrete and masonry construction, the former being constructed of Siemens-Martin steel furnished by the Dillinger Huttenwerke.



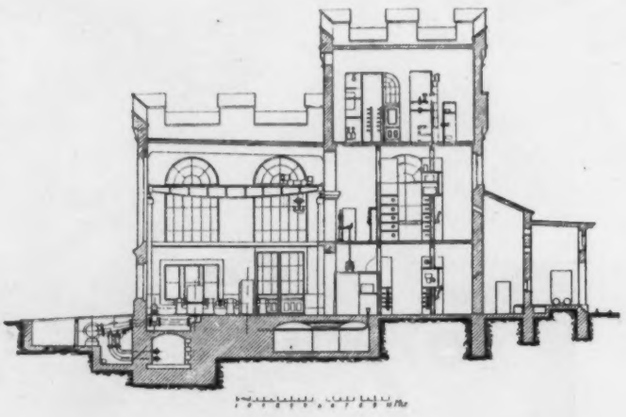
STEEL POLES OF TRANSMISSION LINE.

The Obermatt power station is 680.8 meters above the sea level, and there is a net fall of 300 meters to the turbines, each of which has an efficiency of 75 per cent, and develops 2,000 horsepower, the water used being one cubic meter per second. There are four turbines of the high-pressure bell type installed in this power house, each having a capacity of 2,000 horsepower, one of the four units being held in reserve. To each of these turbines is directly coupled a single-phase and three-phase alternator of 1,380 K. V. A. and 1,850 K. V. A., according to operation as monophase or polyphase machines.

In addition to the four turbines above mentioned, there are two exciter sets with turbines of 175 horsepower each, and a railway generator unit having a direct-connected alternator driven by a 600-horsepower turbine, this generator supplying current for the operation of the Stansstad-Engelberg electric railway.

The 2,000-horsepower, high-pressure turbines operate at a speed of 300 revolutions per minute, and are regulated by automatic governors of the Bell hydraulic Servo motor type, which are said to be most efficient and highly satisfactory. It is stated that with a change of load of 600 horsepower the speed will vary only one-half per cent, and with a load variation of 1,120 horsepower the speed varies one per cent, while the variation is stated to be not over two per cent and three per cent, respectively, for changes of load of 1,610 horsepower and 2,000 horsepower.

The Obermatt turbine and generator room is twelve meters high, thirteen meters wide and fifty-four meters long, and it is provided with an electrically-operated overhead traveling



OBERMATT POWER HOUSE.

crane of thirteen tons capacity for serving the seven turbines and seven-alternator and exciter dynamos. The current is generated at this hydro-electric plant at a pressure of 6,000 volts and raised to 27,000 volts by step-up transformers for use on the transmission line to Luzern, a distance of twenty-seven kilometers. At the sub-station Steghof, in Luzern, the current is reduced in pressure to 2,650 volts and distributed through an underground cable system to the various city transformer stations.

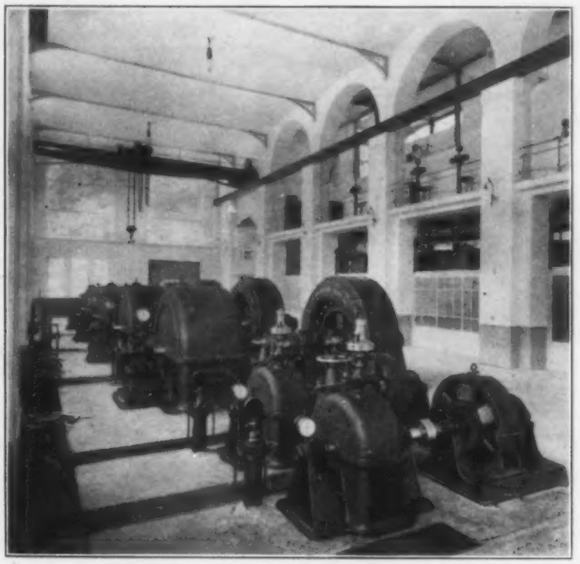
The alternators at Obermatt weigh 36,000 kilograms each and supply a three-phase current having a frequency of fifty periods per second, with an efficiency of ninety-six per cent. The maximum temperature elevation of these alternators, after operating twenty-four hours at full load, is said to be forty degrees Centigrade above the temperature of the surrounding air. The insulation of the armature winding was tested to double the working pressure, or 12,000 volts.

These generators, as well as the exciters and the alternator for the Stansstad-Engelberg Railway, were constructed by the Maschinenfabrik Oerlikon or Oerlikon, near Zurich, Switzerland. The railway generator has a capacity of 540 K. V. A., and has a pressure of 780 volts, the alternating current having a frequency of thirty-two and one-half cycles per second. This machine operated at a speed of 490 revolutions per minute, and has an efficiency of ninety-four per cent.

The exciter dynamos each have a capacity of 100 kilowatts and operate at a speed of 700 revolutions per minute, generating a normal current of 100 volts pressure and 100 volts maximum. These machines have commutators with 120 copper

segments, and they have an efficiency of ninety-two per cent. A storage battery plant has also been provided at the Obermatt hydro-electric plant having a capacity of 1,000 ampere-hours, with a maximum discharge of 1,000 amperes in a single hour, while the battery is capable of supplying a maximum discharge of 1,500 amperes for a quarter of an hour. This storage battery plant is used not only for supplying exciting current, but also for the power station lighting.

The current for transmission to the Steghof and Kreins sub-stations is raised in pressure by step-up transformers of the Oerlikon water oil cooled type, three single-phase transformers being arranged in a group for each electrical generator.



INTERIOR OF OBERMATT PLANT.

These transformers have an efficiency of ninety-eight per cent, and are capable of carrying a fifty per cent overload for half an hour and twenty-five per cent overload for two hours, without injury. The 6,000-volt and 27,000-volt switches and circuit breakers are of the oil type and the busbars, lightning arresters and switchboard equipment are of unique modern construction.

The high-tension power transmission line from the Obermatt plant to Luzern, measures 26.83 kilometers in length. The first line consisted of a single-phase circuit for lighting service in Luzern, about 1,600 kilowatts being used. There is a reserve circuit of three conductors of 88 milimeters diameter each, and two power lines of the same number of conductors of the same diameter, mounted on steel poles and towers erected on masonry and concrete foundations.

In addition to the power-transmission lines on these steel poles, there are two bronze conductors, 3 millimeters in diameter, for telephone service and for signaling. At each pole, for grounding, a copper wire 5 millimeters, is provided with a copper plate having an area of 1 square meter, the above being arranged at every tenth pole. The cross-arms at the top of the poles are 2.1 meters apart, while the total height of the poles is 16.7 meters.

At the Steghof sub-station, the step-down transformers for lighting service are of 700 K. V. A. capacity, while the power transformers are of 300 K. V. A. capacity, designed for lowering the pressure from 27,000 volts in the primary to 2,650 volts in the secondary, the frequency being 50 periods per second. In this sub-station there are also 3 motor generator sets, each consisting of a three-phase motor of 2,650 volts, operating at a speed of 490 revolutions per minute, and driving a direct-current dynamo of 300 kilowatts' capacity, supplying a current at 575 volts pressure. A storage battery is also provided, and the switchboard includes 15 panels for railway feeders, as well as the usual sub-station apparatus of high tension and low tension, together with measuring instruments, lightning arresters, bus-bars and oil switches.

The Kriens sub-station is 4 kilometers distant from the Steghof sub-station, and is equipped with a step-down transformer of 450 K. V. A. capacity, designed for lowering the pressure from 25,000 volts in the primary to 500 volts in the secondary. There is also a sub-station at Stansstad, which is equipped

27000 VOLT BUS-BAR ROOM.

with two sets of transformers of 250 K. V. A. capacity, designed for lowering the pressure from 25,000 volts to 5,000 volts, the latter being used for distribution at Stansstad, other transformers being provided for lowering the pressure again from 5,000 volts to 350 volts.

The iron poles of the transmission line number nearly 500, with a total weight of 371.6 tons, and costing 123,000 francs, or about 262 francs each, or .33 franc per kilogram.

The power plant, including the generators, turbines, transformers and storage-battery plant, as well as the switchboard equipment, cost a trifle over half a million francs, while the transmission line from Obermatt to Luzern, including the transformer sub-stations, with their equipment, cost nearly three-quarters of a million francs.

TRADE CATALOGUES.

The Series Luminous Arc Rectifier System developed by the General Electric Company, Schenectady, N. Y., permits the operation of direct-current luminous arc lamps from alternating current central stations at high economy and with extreme simplicity, and is described in Bulletin No. 4556.

The General Electric Company, Schenectady, N. Y., describes a new line of cylinder controllers with improved magnetic blowouts which can be used on systems on which the voltage peaks reach 750 volts, in Bulletin No. 4557, recently issued. The bulletin gives the details of construction and dimensions of the different controllers.

INLAND EMPIRE DEVELOPMENT.

Three million dollars was expended in the development of water power in the Spokane River for transportation and commercial purposes in 1907, thus adding nearly 25,000 electrical horsepower to the output, placed at 46,000 horsepower, a total of 71,000 horsepower, and it is expected that 50,000 horsepower will be added this year, in various parts of the Inland Empire. The most pretentious work was the building of the $1,000,000 power plant for the Spokane & Inland Empire system at Nine Mile, nine miles north of Spokane, which will be in operation next April.

To utilize the water of the river at that point for generating electric energy the building of a mammoth dam was necessary. The dam and buildings in which the machinery is now being installed were completed last November. With the machinery constituting the initial installation the Nine Mile power plant will generate 20,000 horsepower. The current will provide the motive power for running all the trains of the Spokane & Inland Empire system, which operates 149 miles of electric road.

In the improvement of its power plant at Spokane Falls, Spokane and at Post Falls, twenty-four miles east of Spokane, the Washington Water Power Company made extensive additions of machinery. In the Spokane plant the company completed the installation of a 1,500-horsepower motor generator the latter part of December. This serves the purpose of converting the high voltage alternating current to a direct current of low voltage. The company has placed an order for a 2,000-horsepower motor for converting the current generated at Post Falls.

A 3,200-horsepower turbine driven generator was added to the equipment of the Post Falls plant last year. This plant now comprises four 3,200-horsepower generators, and the company has placed an order for one more turbine-driven generator of the same developing capacity, which will be installed in April. The Post Falls plant is developing 10,000 horsepower at Spokane Falls, and with the addition of the machinery contemplated it will deliver 13,000 horsepower in Spokane.

The Washington Water Power Company has in preparation plans for increasing the generating capacity of the Spokane plant to 40,000 horsepower. The head of water from which the power is now derived is 78 feet above the turbines from which are developed 15,000 horsepower. The plans provide for the extension of the flumes to the extreme high head of water, between Washington and Division Streets. By the extension a total fall of 134 feet will be conducted through the flumes and provide nearly three times the power now developed.

With the current generated at the Spokane and Post Falls plants, the company operates ninety miles of street railway in Spokane. electric lines to Medical Lake and Cheney, the Spokane electric lighting system, and furnishes electricity for lighting systems and power in Coeur d'Alene, Post Falls, Idaho, Colfax, Palouse, Tekoa, Farmington, Garfield, Oakesdale, Rockford, Medical Lake and Cheney, in addition to that consumed in Spokane in the operation of mills, factories and for general purposes.

The Big Bend Water Power Company, capitalized at $2,000,000, has completed plans for the construction of a plant twenty-eight miles west of Spokane, on the Spokane River. This plant will have a capacity for developing 20,000 horsepower. The company proposes to begin work next spring to insure the completion of the plant in less than two years. The Chicago, Milwaukee & St. Paul also is planning to develop much electrical power on the St. Joe River in Northern Idaho, east of Spokane, and will use this power in operating its trains over the Bitter Root Mountains.

The Washington Water Power Company completed the Cheney suburban line during the year. It also completed a steam auxiliary station and strung a high power line to the mines and the Coeur d'Alene district, 140 miles.

The Spokane & Inland Empire Company completed extensions of the Spokane & Inland electric line from Waverly, thirty-four miles south of Spokane, to Spring Valley Junction, and from that point by two lines, the present terminals of which are Colfax and Palouse. The total length of the extensions completed is eighty-two miles.

The Coeur d'Alene & Spokane electric line of the Inland Empire system was double-tracked from Greenacres to Spokane Bridge, six miles, and a branch two miles in length was built to Liberty Lake.

Announcement is made that the Spokane & Inland Empire Electric Railway system has adopted the Steptoe Canyon route in reaching Clarkston and Lewiston, south of Spokane, and it is expected that a permanent survey will be run in a short time and construction work begin next spring. The mouth of the Steptoe Canyon strikes the Snake River nine miles below Clarkston, and a fine grade is allowed from the Palouse plateau to the river. The survey runs along the north bank of the Snake River to a point near Dry Gulch, where it crosses to Clarkston. The plan in entering Lewiston is to bridge the Snake River.

TUNGSTEN.

The United States, with 1250 short tons, gave nearly one-third the world's production of tungsten in 1907, another one-third coming from the Australian states and New Zealand, and the remainder from Portugal, Great Britain, Malay Peninsula, Spain, Austria, Germany, France and Bolivia. Boulder County, Colorado, and Kern County, California, have produced most of the tungsten in this country. Cochise County, Arizona, produces a small amount, and deposits are known at Lordsburg, New Mexico; Loomis, Washington, and Butte, Montana. Market prices at the end of December were $420 to $450 per ton for concentrates carrying 60 per cent tungsten acid. The unique properties of tungsten for the manufacture of ferro alloys (used in hardening steel), as well as for the preparation of the filaments of incandescent lamps and for many minor industrial purposes, have created a demand which promises to increase steadily. As a result, prices have advanced, which in turn have initiated energetic prospecting for deposits of tungsten not alone in the United States, but in every country in which there is a possibility to make a discovery. Consequently the supply is getting larger, but consumption, especially in the European steel industry, is also growing apace; in fact, the demand for the better grades of ore exceeds the quantity offered by miners.

PRACTICAL ASPECTS OF STEAM RAILROAD ELECTRIFICATION.*

By W. N. Smith.

(Concluded.)

We now come to a phase of the question which in the writer's opinion is probably the most complicated and least understood of all; namely, the standpoint of the railroad operator or transportation superintendent, and his organization, upon whom the railroad depends for maintaining its earning power. It hardly need be said that the transportation man has it in his power either to make or mar the earning capacity of a railroad, and no matter what facilities for increasing transportation capacity are furnished by the management, the duty of making them pay dividends devolves upon the operating department. The business of a railroad being primarily transportation, and transportation being the special function of the operating department, we here come in contact with the highly trained specialist, upon whom falls the burden of getting the traffic over the road, whether it be level or hilly, straight or crooked, single or double track.

It is conceded by all, that the great thing to be desired in a railroad of given proportions is capacity for train-movement. The capacity of a double-track road is stated to be in general, about four times that of a single-track road, general conditions as to grade and location being equal; but as more than seventy per cent of the railroad mileage of the country is single track, the most universal problem of increasing track capacity by electrification will apply to single-track rather than to double-track lines. This, of course, excepts terminal and suburban conditions, but includes the majority of mountain railroad conditions where double-tracking is sometimes a physical impossibility.

Engineers familiar with the interurban trolley development of the past ten years are aware that most lines of this type dispatch their trains very largely by the telephone system. Generally speaking, this method works very well, though on the more highly developed systems it is combined with some of the features that have been standardized by the rules of the American Railway Association, and adopted by practically all the steam railroads. It must be remembered, however, that conditions on trolley roads are somewhat different from those on steam roads. The vast majority of the trains are light passenger trains of one car each, stops are of shorter duration, and the speed of all trains is more nearly uniform. The distance between turn-outs is less. The penalty of a wreck due to misunderstanding or miscarriage of orders is, generally speaking, much less with the average interurban trolley road than with the average steam railroad; and trolley railroad operators are correspondingly more willing to run the risks incidental to dispensing with the system of transmission of train orders, which experience has shown to be necessary on steam railroads. The meeting points are generally much nearer together, and a block system of any kind would cost relatively more to maintain and operate in proportion to the business done than is the case with steam railroads. At least, there seems to be some such motive preventing the universal adoption of signal systems by trolley roads. In any event, it is not at all convincing to a steam railroad man to point out to him the apparent ease with which trains at frequent headway in opposite directions are handled with single-track trolley roads, as a reason why the same course should be adopted by steam railroads in order to increase the rapidity of train movements. Although it is undoubtedly true that the telephone is used extensively as an adjunct to standard methods of dispatching steam-railroad trains, railroad managers generally do not seem disposed to supersede the method developed by the use of the telegraph, except in the relatively small amount of mileage protected by automatic block signals.

*Condensed from a paper presented at a meeting of the Ithaca Section of the American Institute of Electrical Engineers, Ithaca, N. Y., Dec. 6, 1907.

Whether the telegraphic train-order system or one of the other systems of block signals be used, the rules governing the operation of trains on steam railroads are very rigid. The telegraphic train orders, emanating from the train dispatchers' office, must be signed by the recipient and the signature telegraphed back to the dispatcher, who then replies "complete" to the various operators to whom he has sent the message as fast as their replies come in. An order restricting the rights of a superior train is more rigidly safeguarded in this respect than an order increasing the rights of an inferior train; and a superior train must receive and reply to its orders before any can be given to the inferior train. Much time may be, and often is, thus consumed, which may restrict considerably the capacity of a line to handle traffic. Another rigid type of rule is that requiring an inferior train to clear the time of a superior train at a meeting or passing point by not less than five minutes. This holds whether a train-order system or a block-signal system be used. This five minutes' clearance is frequently, for special reasons, increased to ten minutes, and often to twenty minutes, thus placing the inferior trains at a still greater disadvantage. Instances of this kind occur when some especially fast express train is operated, where, to insure the greatest possible degree of safety, twenty minutes' clearance is provided. The fastest high-speed "flyers" of the present day are thus protected, to the greater safety of the passengers, but to the disadvantage of freight trains. Two such flyers, one in each direction over a road per day, will thus cut down the current of slower traffic over the whole road to the extent of at least forty minutes per day, and frequently more. If an inferior train cannot make an intended siding in time to allow for the required clearance, it is obliged to wait on a nearer siding and lose the time required for the superior train to cover the distance between the two sidings, plus any extra time which the superior train may have been delayed. One such delay is more than likely to lead to another, and so the delays pile up into hours during the run intended to be made in ten or twelve hours. If traffic is dense, and sidings far apart, such delays become very serious, and besides the delay to freight, and disappointment and inconvenience to shippers and per diem charges on cars, there is added the overtime due to the employees, which increases the operating expenses. It seems to the writer that conditions of this character are not taken into sufficient account as having a bearing on the subject of electrification for increase of track capacity; and something more than the ability to accelerate rapidly and maintain higher speeds must be given consideration in estimating the increase in the net schedule speed of train movement than at first sight may seem directly to result from the substitution of electricity for steam.

One item peculiar to steam operation which causes delays is the stopping for water. The frequency for such stops will depend both upon the weight of the train, and the grade of the road. Stopping for water sometimes adds to the delays from other causes that have previously held up a train; but for any particular problem the effects of stops for water should be considered separately from stops for other purposes. Where combined with a stop for some other purpose, no marked gain is effected by eliminating the necessity for taking water, unless perhaps three or four engines were to take water in succession.

A case was recently cited of a single-track road in a mountainous country where double tracking would be a very expensive proposition, this road having a heavy traffic in both directions, loaded ore cars coming down and empties going up. It was found in operation that the easiest way to get the traffic over the road was to make every siding a meeting point; that is to say, the road was practically full of trains. The only way of increasing traffic on such a line, other than by double-tracking, would be to increase the speed of all trains in the same proportion. This might seem feasible enough by electric motive power, but then arises the question whether the increase in speed that could be thus obtained would be sufficient to enable an increase in the daily traffic that would pay a dividend on the total cost of electrification.

ELECTRICAL CONTRACTORS' BANQUET

AT FAIRMONT HOTEL, JAN. 18, 1908

By request, because of the poor workmanship on this picture last week, we reproduce it in this issue.

BRENNAN MONO-RAILWAY.

On exhibition at the Electrical Show recently held at Chicago was a model of the Brennan mono-railway, which was described in these columns some months ago. An English exchange states that the inventor is operating a model car, 6 feet long and 18 inches wide, over a one-rail track that represents every phase of difficult ground.

The track wheels are in a single line through the center of the car instead of at the sides, as is usual, and are carried on compound bogies at either end of the car, being electrically driven by storage batteries placed in the body of the car. All the wheels are power driven, and an efficient system of brakes is also fitted. Inside the house on the car is fitted the automatic mechanism, which gives to the car its characteristic features of being able to maintain its balance whether standing or moving in any direction at any rate of speed. This consists of two heavy fly-wheels, rotated by electricity in opposite directions. These wheels are mounted so that their gyrostatic action and stored energy can be made use of. Mounted on high-class bearings to reduce the friction at the journals as much as possible, the power required to keep them in motion is very small. The work stored up in the wheels is so great, and the perfection of the bearings so good, that should anything happen to the driving machinery the wheels would continue to revolve for quite a long time, in the case of the model car long enough to keep it stable while it was running all round the grounds; in a full-sized car for some five or six hours. Provision is made for the safety of the car by the fitting of two legs, one on either side, which can be lowered very easily and quickly. The power for driving the car need not, of course, be electrical; any type of motor is suitable, either steam, gas, petrol, or electrical, as local conditions permit. The rail which the car runs on in the grounds is of circular section, but for ordinary work would be of the same type as that at present used, and would only require to be of the same weight to carry the same load on the same number of wheels. Sleepers need only be half the length as now in use. In war time, for conveying of troops and war material, the system offers exceptional advantages, as flying tracks could be laid over most difficult grounds, and when bridges had been blown up or otherwise destroyed, all that would be required to safely cross a river would be steel wire hawsers of sufficient strength, and safely anchored and drawn taut on either side of the stream. One of the strangest points about the wire bridge is that the car is more stable on the wire than on the ground, due to the fact that as the car sways the wire sways with it, and the lines of disturbing forces and righting forces are more readily equalized and stability maintained.

To watch the 6-foot model taking curves whose radius was about what would be obtained by bending the rail around the knee, running along a zig-zag track, the lengths of the sides being about 1 foot and the angles about 65 degrees or 70 degrees, seemed marvelous. The car was switched onto a circular track, where its wonderful righting powers were clearly demonstrated. While running at a considerable speed, weights representing from 1 to 3 tons were taken from the center of the car and placed on the outside edge, the result being that, instead of dropping towards the side the weight had been placed, it acted in the opposite manner, and raised itself on that side just as a man would throw up the shoulder he was carrying a weight on to bring himself into a stable position again. It was run up an incline of one in five. The car having been run around the grounds was then put on a track leading to a wire bridge, which was stretched across a span of some 50 or 60 feet, having an incline of one in eight, and about 6 feet or so off the ground. The car was run backwards and forwards over the bridge, and its perfect safety made the more certain to those watching by the inventor's assistant engineer, whose weight was something like 10½ stone, taking a seat in the car and making several journeys across the wire, as well as stopping in the center of the span. The weight of the engineer represented to scale some 32 tons, and the center of gravity of the car while so loaded must have been abnormally high.

The Indian Government has granted £6000 for the building of a large car, and, in addition, the War Office has granted the use of the Brennan Torpedo Factory, as well as the use of the land adjoining, for still further carrying on the work.

BATTLE CREEK POWER LITIGATION.

On February seventeenth, at Redding, California, is to be tried a riparian rights case that will be of direct concern to all interested in the development of hydro-electric power propositions. The question is contested between the Pacific Power Company and the Battle Creek Power Company, a subsidiary of the Northern California Power Company, as to who is the lawful owner of the water rights of Battle Creek. It seems that twelve years ago these rights were located by the Mt. Lassen Water Company, who, foreseeing their value, but being unable at the time to properly develop them, set one man at work breaking trail, piling stones and in other ways as they supposed complying with the letter of the law. But this guardian of the property being obliged to leave the claim for a longer period than the law allows, these claims were jumped by the Battle Creek Power Company, assuming that there was no representative of the Mt. Lassen Company on the property They pursued the same "dog-in-the-manger" tactics. In the meantime, the representative of the Mt. Lassen Water Company returned from his visit to San Francisco and prosecuted his work also.

But, unheedful of the means by which new title had been claimed, the Battle Creek Power Company's agent left his work to build a house on a homestead claim. Whereupon the Pacific Power Company appropriated the rights and set thirty-five men at work digging ditches. They had already bought a large tract of land from private parties for a power plant site, and to secure title had bought out the claim of the Mt. Lassen Water Company, the original locator.

Meanwhile, the Battle Creek Power Company had come under the control of the Northern California Power Company, and work was started on a dam whose overflow would flood the power plant site of the Pacific Power Company with ninety feet of water. Condemnation proceedings were instituted by the Battle Creek Power Company, who claims to be the owner of the water rights. This is the case to be tried.

As the outcome of this case will greatly interest hydro-electric engineers, the "Journal" hopes to publish the final decision in full. From an independent standpoint, we deplore this policy of endeavoring to keep just within the letter of the law and retard legitimate development which other parties are anxious to pursue.

APPROVED APPARATUS.

FIXTURES.

Morse adjustable fixtures for mounting on benches or side walls. Cat. Nos. 1 to 5, inclusive. Approved Jan. 3, 1908. Manufactured by

Frank W. Morse, 516 Atlantic Ave., Boston, Mass.

FLEXIBLE CORD, PORTABLE, FOR ELECTRIC HEATERS.

Double or triple conductor cords composed of braided conductors with rubber and asbestos coverings, the several conductors separately protected by woven cotton braids and enclosed by an outer glazed cotton covering. Approved Dec. 31, 1907. Manufactured by

General Electric Co., Schenectady, N. Y.

WIRES, RUBBER COVERED.

Marking: Green and black thread parallel in braid. Approved Dec. 31, 1907. Manufactured by

W. R. Brixey, 203 Broadway, New York City.

THE JOURNAL OF ELECTRICITY POWER AND GAS

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VOL. XX FEBRUARY 1, 1908 No. 5

EDITORIAL.

High-Efficiency Lamps And The Central Station.

At the beginning of this year came the announcement of leading incandescent-lamp manufacturers that they had for sale a practical tungsten lamp. This announcement is fraught with far more importance than appears at first sight. It is the culmination of a long series of painstaking experiments in the face of great difficulties. It is but one of a large number of attempts to produce a more efficient source of incandescent lighting than the old carbon filament. The first of these to attain commercial success was the graphitized filament or Gem lamp, which gave 326 candlepower-hours per kilowatt hour as compared with 236 given by the ordinary carbon filament. The Nernst lamp, giving 307, is not included in this discussion, nor are the various arc lamps. Next came the 44-watt tantalum lamp, which gives 364 candlepower hours per kilowatt-hour. Finally we have the tungsten lamp, which in recent experiments has been found to give 617 candlepower-hours. In the course of these experiments it was shown, in a paper read by Mr. Arthur J. Sweet before the Pittsburg section of the American Institute of Electrical Engineers, that an ordinary 56-watt carbon filament incandescent lamp rated at 3.5 watts per candle and 16 horizontal candlepower gave 13.2 mean spherical candlepower and required 4.24 watts per candle. A 60-watt, 110-volt tungsten filament at 1.25 watts per horizontal candlepower gave 37 mean spherical candlepower, requiring 1.62 watts per candle. In other words, the tungsten lamp gives more than two and one-half times the amount of light for the same current consumption.

Till now, this high efficiency has been counteracted by the high price and great fragility of the imported German lamps, preventing any extensive use. But by careful packing they may be shipped without danger of breaking. The use of spring-anchored filaments also allows them to be burned in any position. In addition, they emit a white light that renders true color values. It is also stated that the tungsten lamp, likewise the tantalum, is little affected by voltage variations and allows inherent regulation.

It will be but a short time before the public will realize these advantages of efficiency and economy and put in these lamps, as they are claimed to have an average life of 1,000 hours and are not easily burned out by the application of excessive voltages. The helion or silicon lamp, the osmium, zirconium and iridium lamps are also in the race, the former bidding fair to give the desired "one-watt-per-candlepower."

This makes clear our opening statement of the importance with which these developments are fraught, especially to the central station men. For certainly they are interested in a lamp that uses so much less current to give the same illumination. Some pessimists prophesy decreased current consumption and consequent decreased incomes. But analysis will present a more optimistic view. This is primarily based on the difficulty in the manufacture of low candlepower metallic-filament lamps. Of the two sizes advertised in this country, one consumes 40 watts to produce 32 candlepower, and the other 60 to produce 48 candlepower, which is not so very different from the common 50-watt carbon-lamp consumption. It means more light at the same cost, rather than the same light at less cost. But granting for the sake of argument that there will be a slight diminution in the amount of current used by each customer, it will allow more customers to be taken on the present overloaded circuits. Again, it will reduce the lighting peak to near the average load level, which can thus be raised without danger of the maximum exceeding a safe limit. More consumers can be added without purchase of new machinery, and with better lights many will be attracted who cannot now be induced.

But it is in the first cost of a new lighting plant that the saving will be most noticeable. Smaller generators and smaller distributing wires will supply more light to more customers than under present conditions. Interest on investment, taxes, insurance and depreciation will be materially lessened, and it will form a more attractive proposition to the investor who realizes the limitations of a high peak. Running expense of supplies and attendance will be less for the same service. So, instead of the somber outlook of reduced revenue, this blessing in disguise illuminates the trail of greater returns on every dollar invested.

SHALL WE KILL OR FEED THE GOOSE?

Considerable publicity has been given by the Welsbach Company to a cartoon entitled, "Killing the Goose That Laid the Golden Egg." Through the courtesy of the "Illuminating Engineer," we reproduce this, together with a companion picture of "Feeding the Goose," which is self-explanatory to our central station readers. But these two cartoons are also indicative of what has been done in many other business lines whose watchword is "retrench." Some managers who now say, "I cannot afford to advertise," two years ago said, "I do not need to advertise." Then they were engulfed in the great wave of prosperity that filled their shops with more than they could handle. Now, when threatened with the reactionary wave of business depression, they neglect the one bulwark that will stop its course and store up business for them on a safer and saner level. The flood tide of renewed confidence is returning, and the wise man is preparing for it in this temporary lull.

With a meritorious article, there are but two fundamentals for business success: to find the market and to properly exploit it.

Today's biggest market is the rapidly growing territory west of the Rocky Mountains. It suffered less in the recent bankers' panic than any other section of the country. It is a producer of raw material even while it is the greatest consumer of your manufactured product. It is a lender, not a borrower. Fruit, grain, lumber and mineral we sell. The money this brings us we spend for improvements. These basic products have given us the financial soundness that induced Eastern capitalists to advance $5,000,000 for the reconstruction of the United Railroads in San Francisco. This is but one instance of the millions in money that are to be expended in the power development of the West. Surely your product will be necessary in the work.

To exploit it, is there anything better than a technical journal that for fifteen years has summered and wintered with the engineer and contractor in the Western camps; that

is read from cover to cover because it tells what he and his are doing, and that has earned his regard and confidence by long-tried test? The men who first advertised to make their house and their goods well known among prospective customers are today selling goods to our readers. One of the most successful supply houses in the West is universally credited with having gained and held its prestige because of its extensive and persistent advertising in our columns. You can do likewise and thus smooth the way for your salesmen and shorten the time necessary to get acquainted, by advertising. What advertising is doing for your competitors it can do for you. Our readers and buyers believe that nothing but the best is advertised. Can you afford to stand the comparison when not represented?

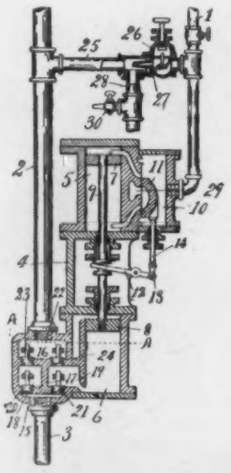
There is a further point in connection with this whole matter of advertising that deserves to be noted, viz., the close attention given the advertisements appearing in a technical journal. No matter how well the contents may be prepared, that portion of it represented by the announcements of prominent and progressive business men is by many readers deemed to be the most interesting. In the Editorial section there is always present the possible element of academic opinion. This is eliminated in the advertising assertions in the technical press. This part of a technical journal always affords the surest index of what may be styled the present state of the art. All that is therein claimed is entitled to the fullest measure of confidence, as it is the result of exact, costly and long-continued trial. The manufacturer of electrical machinery does not make his customers pay for his experiments; he has trial tests of his devices oft repeated till the standard of perfection is attained as nearly as possible, and then he makes public announcement in the advertising columns of what is necessarily the newest in his lines. What he says is not theory or supposition, but may be relied on as being authentic, for he cannot afford to do otherwise. Hence it is that there is great truth in the remark of a reader that in the advertising columns he finds the latest electrical news, and consequently reads them first.

And, having tried the remedy, do not use it intermittently. A car that is started and stopped, and started and stopped, doesn't get there as soon as the one that runs right along. Not only that, but it wears out sooner, as the wheels and brake shoes are worn away and the cars racked by this disinclination of matter to stop. "Keeping everlastingly at it brings success."

PATENTS

PUMP OPERATED BY COMPRESSED AIR. 876,849. Danvill W. Starrett, San Francisco, Cal.

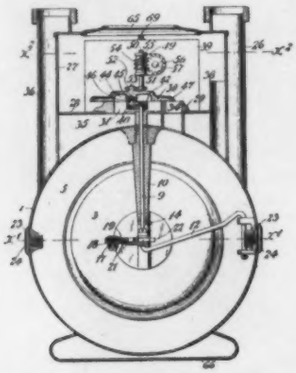
In an apparatus of the character described, the combination of a compressed air pipe, a water discharge pipe, a chamber at the bottom of said water discharge pipe having two lower compartments each having an inlet valve therein, a cylindrical pump, the opposite ends of which connect respectively with said compartments, a compressed air cylindrical motor having a pis-



ton substantially equal in diameter to the pump piston and connected therewith to move in unison, said compressed air motor being connected with the compressed air pipe to be operated thereby, an upper compartment having check valves communicating respectively with the lower compartments, said upper compartment also communicating with the water discharge pipe, and a passage from the compressed air pipe to the water discharge pipe sufficiently large to distribute the air through the latter pipe so as to reduce the weight of the water upon either of said check valves below the compressed air pressure, whereby the pump can operate under said compressed air pressure to force water therethrough, substantially as described.

GAS-METER. 876,875. Thomas Henning, Charles E. Henning, and William J. Henning, Pasadena, Cal.

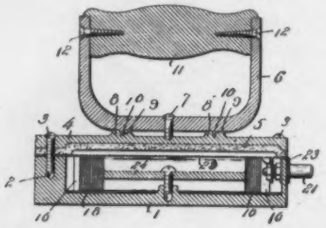
In a gas meter, the combination with the gas pressure operated shaft, provided with an adjustable crank, a rotary



valve operated by the crank, another shaft having crank connection to the valve member to be operated thereby, a worm and detachable means for securing it to its shaft, and a dial operating worm wheel engaging said worm.

ELECTRIC SAD-IRON. 876,639. Williard M. Harwood, Ontario, Cal.

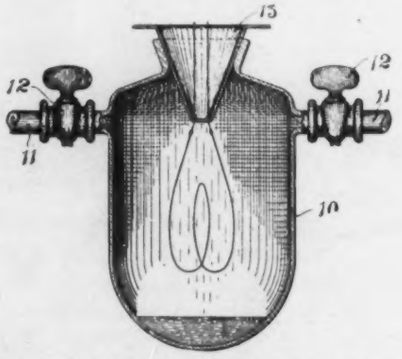
In a device of the character described, a body, cores therein, insulating material covering the cores and wires wound upon said insulation and extending substantially the entire length



thereof to bring the same well into the toe of the body and means connected to the bottom of the body and pressing laterally against said cores to keep them in place.

PROCESS OF MAKING ELECTRIC LAMP FILAMENTS. 876,331. Walter G. Clark and Herschel C. Parker, New York, N. Y., assignors to Parker-Clark Electric Company, New York, N. Y.

The process of making filaments for incandescent electric lamps, which consists in heating a filament by passing an elec-



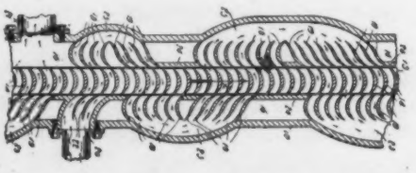
tric current through it in an atmosphere containing marsh gas, olefiant gas, carbon dioxide, and a substance containing silicon, whereby we secure the following reaction:

$$SiCl_4 + CH_4 + 4C_2H_4 + CO_2 = Si + 4(C_2H_5Cl) + 2(CO).$$

The silicon being deposited on the carbon filament.

STEAM-TURBINE. 876,530. Frederick A. Douse, Seattle, Wash.

In a steam turbine, in combination, a casing having inlet and outlet openings and having annular chambers in each side provided with recesses, a wheel rotatably mounted within the casing and provided with a rim, buckets of concave-convex form disposed on said rim with their convex surfaces disposed in the direction of rotation of the



wheel, a band secured to the outer extremities of the wheel buckets, a plurality of blades of substantially crescent shape and a plurality of blades of compound curved contour arranged in said annular chambers, the said different types of blades arranged in groups of successively increasing numbers in each chamber, the said blades of crescent shape disposed to present the convex faces opposite to the direction of the wheel and the other blades arranged in diagonal planes with their inner edges disposed in the direction of the revolution of the buckets.

INDUSTRIAL

FREQUENCY CONVERTER SET.

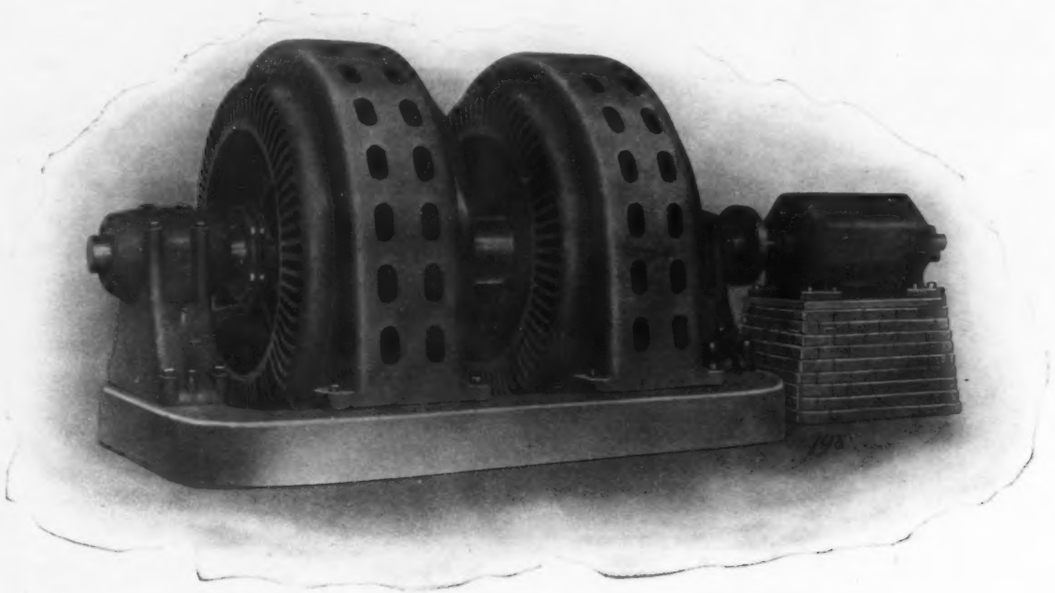
The various frequencies employed in alternating current work, though each adapted to the particular service required often lead to complications where it becomes necessary to combine the services from two systems of different frequencies; for example, when a 25-cycle isolated power plant becomes overloaded and it is necessary to purchase power from a public lighting service of 60 cycles.

In direct current work, the same trouble might arise from difference in voltage, were it not that direct-current voltages have been thoroughly standardized in this country. All direct-current power apparatus is designed for 230 volts, which is supplied by any direct-current central station. Even if 115 volt lighting current is required it can be readily furnished from a 250-volt system by means of a small rotary balancer of about one-tenth the capacity of the power required.

In changing the frequency of alternating-current supply, however, it is necessary to have two machines, each of the full capacity of the power transformed. In transforming a service of 60 cycles, for instance, to 25 cycles, a 60-cycle motor is required, driving a 25-cycle generator.

Frequency converters are also of use in sub-stations of long-transmission lines. Low frequency is desirable for alternating-current transmission, both for regulation and power factor. High frequency, however, is required for lighting distribution. A frequency converter, therefore, can be conveniently used at the sub-station to change the low frequency of the current received from the distant generating station to high frequency for local lighting. A number of frequency converter sets have been built for this purpose by the Crocker-Wheeler Company for the Shawinigan Falls Water, Light & Power Co.'s Montreal station.

The accompanying illustration shows a frequency converter of 1,000 K. V. A. capacity, installed in the plant of the Pennsylvania Steel Co., Steelton, Pa. The 25-cycle power plant of this company became too small to carry the full load of the plant. This C.-W. frequency converter set was therefore installed to utilize the 60-cycle service of the York Haven Power Company during the hours of heavy load.



1000 K. V. A. 60/25 CYCLE C-W FREQUENCY CONVERTER.

The set consists of two Crocker-Wheeler machines mounted on a heavy shaft, and a starting motor.

The motor unit is a fourteen-pole, 1,150 K. V. A. machine, and the generator unit is a six-pole machine. The change in frequency is therefore 60 cycles to 25.7 cycles. The starting motor is a Crocker-Wheeler direct-current, Form "W" rolling-mill motor, having enormous starting torque and specially designed for short runs at very heavy loads. The starting motor is used only to bring the set to synchronism at 514 revolutions per minute. The well-known ability of Crocker-Wheeler alternating-current apparatus to operate in parallel makes the synchronizing of the set a simple matter.

The set is usually employed to carry a part of the load of the plant independently of the company's power plant. In emergencies, however, the plant is thrown in synchronism with the 25-cycle end of the set.

CHICAGO FUSE WIRE & MFG. CO. ELECTRICAL SHOW EXHIBIT.

The accompanying picture shows the exhibit of the Chicago Fuse Wire & Mfg. Co., at the Third Annual Electrical Show given by the Electrical Trades Exposition Company, at the Coliseum, Chicago, Ill., beginning January 13. This exhibit attracted the attention of the practical men by its attractive and comprehensive showing of the wiring contractor's needs. One display board was devoted entirely to

"Union" enclosed fuses, both old and new code. Another showed the construction and mechanical perfection of "Union" switch boxes. The next displayed "Union" enclosed fuse blocks, N. E. code. Fuse wire, fuse strip and fuse links were arranged on another board, while on the one adjacent appeared "Union" conduit outlet boxes and covers, round and square. The remaining board had a combination of enclosed fuses and blocks, also of "Union" make. The sales representative, Arthur S. Merrill, had charge, being assisted by Geo. C. Reid and Walter D. Dana. As a whole, the exhibit of the Chicago Fuse Wire & Mfg. Co. elicited considerable favorable comment.

TRADE CATALOGUES.

The January "Holophane" contains its usual quota of correct principles of scientific lighting, together with typical illustrations for all classes of service.

"Common Sense," from the Electric Controller & Supply Co., of Cleveland, Ohio, is a new magazine "devoted to fundamental democracy, humor, and industrial and commercial sociology." It is good reading.

"Linolite," from H. W. Johns-Manville Co., describes a modern system of lighting, employing a continuous, semi-circular reflector with long tubular incandescent lights. It is particularly adapted for window and picture lighting.

The Northern Electrical Manufacturing Co., of Madison, Wis., sends a booklet on "Variable Speed Motors," which contains some interesting facts about the single voltage variable speed system. This employs regulating poles and coils to give a shunt field control.

KOERTING OIL-FIRING SYSTEM ON JAPANESE STEAMER.

The Toyo Kisen Kaisha Steamer Soyo Maru at present in San Francisco Bay, is attracting a large number of visitors on account of the peculiar oil firing system. She was built in England and is fitted with the Koerting system of oil firing. The oil with a gravity of 16 to 17 degrees Baume and kept under 40 pounds pressure is superheated to 220 degrees F. and leaves the Koerting centrifugal spray nozzles perfectly mixed with air so as to give complete combustion. It is obvious that this system using neither air nor steam to spray the oil from the burners is superior to many of the present methods, as there is such a great saving of steam. These results show that apprehensions regarding the carbonization of fuel oil wtth asphaltum base are groundless. The Schutte-Koerting Company of Philadelphia have just issued their new catalogue No. 6, Section O, which will be of interest to all large fuel oil consumers. O. C. Goeriz and Company of San Francisco are the Pacific Coast representatives.

The Westinghouse Electric & Manufacturing Co. is now distributing a well-written treatise on alternating-current and direct-current integrating wattmeters. Not only the mechanism and construction, but also the principle on which the meters operate, is fully described. A large number of illustrations showing the various parts of the meters will be helpful to those interested in meter design, and a complete set of connection diagrams should be of great assistance to those called upon to install meters on the various classes of commercial circuits. A well-arranged index is supplied to assist in clearly locating any particular subject covered by the circular.

PERSONAL.

George Beardslee, Secretary of the Beardslee Chandelier Mfg. Co., of Chicago, was in the city for a few days the past week.

Robt. McF. Doble, consulting and supervising engineer, has moved his office from Colorado Springs to 529 Majestic Building, Denver, Colo.

Arthur Williams, of New York, has accepted the chairmanship of the committee on public policy of the National Electric Light Association. W. H. Gardiner, 60 Wall Street, New York, will continue to act as secretary of the committee.

George Moraine, who has been general superintendent of the Ben Hur Interurban Company in Crawfordsville, Ind., has handed in his resignation, to take effect February 1st. Mr. Moraine will engage in the electrical business on the Pacific Coast.

A recent patent provides for the lighting of harbors subaqueously. A cable connected with a source of electric supply is laid along the bottom of the harbor, and to it are attached incandescent electric lamps equipped with parabolic reflectors, which will mark out the course of the channel by brilliantly lighted spots on the surface of the water. In foggy weather this beam of light would be particularly useful in guiding a vessel.

NEWS NOTES

FINANCIAL.

San Francisco, Cal.—A special meeting of the Bay Shore Water Company will be held in this city on January 30, to act upon a proposition to dissolve the corporation and wind up its affairs.

San Francisco, Cal.—Last week the Board of Supervisors passed to print a declaratory ordinance for the issue of bonds to the amount of $32,000,000. A portion of the proceeds of these bonds is to be used for the construction of an auxiliary water supply system for fire protection.

San Francisco, Cal.—The State Supreme Court has decided that the San Antonio Water Company, which has developed water in San Antonio Creek by sinking wells in the bed of the creek, is entitled to the use of these waters without dividing with the Pomona Land & Water Company, which has a claim on the surface waters of the creek.

Vallejo, Cal.—The Board of Trustees and Board of Works of this place have decided to call an election to decide on a proposition to issue bonds to the amount of $80,000, the proceeds to be used for the construction of a second reservoir in the Wild Horse Valley for the municipal water system. The proposed reservoir will hold 600,000,000, and will be located fifteen miles from this city.

Los Angeles, Cal.—The city of Los Angeles has won its suit in the matter of the license tax of $100 per month levied against the Los Angeles Independent Gas Company. The Supreme Court holds that, though the business of the company amounts to only $1,500 per month, while the business of its rival amounts to many times that amount, the ordinance cannot therefore be held discriminating and unconstitutional.

Los Angeles, Cal.—The Supreme Court of the State has decided in favor of the city in the matter of the ownership of the water of the Los Angeles River, which was contested by the Los Angeles Farming & Milling Company. The court held that the city, as the successor of the old Mexican Puebla of Nuestra Senora Reina de Los Angeles, was entitled to the water of the river through the treaty by which California became a part of the United States.

TRANSMISSION.

Dinuba, Cal.—The San Joaquin Light & Power Company is figuring on the stringing of a power line from this place to the Stone Corral country.

San Diego, Cal.—P. F. Schaniel and E. W. Jones have secured a franchise to develop electricity from the tide waters of False Bay, in this county.

Las Vegas, Nev.—E. H. Syphus and Levi Syphus, of St. Thomas, Nev., have made application to be permitted to appropriate the waters of the Spring and Rio Virgin Rivers for power and mining purposes.

Yuma, Ariz.—A. W. Womble states that if the Government will grant him water rights on the Colorado River he will build a 1,000-horsepower electric plant from which a transmission line will be run to a proposed mining mill at Kofa, in the King of Arizona district.

Oroville, Cal.—Warren Sexton, acting for the Great Western Power Company, has applied to the Board of Supervisors of this county for a franchise for an electric transmission line through the county. The line will carry 100,000 volts, the cables being suspended from steel towers 130 feet high.

Honolulu, T. H.—Jas. A. Coke, of Maui, is now in Washington, looking after a movement to secure a franchise for the installation of a power plant on Maui. The plant, for which it is hoped the franchise will be approved by the present Congress, is to supply electricity to the towns of Lahaina and Kahului, and to a number of plantations.

Oakland, Cal.—E. M. Downer, of Pinole, representing the Great Western Power Company, has been awarded a franchise by the Board of Supervisors for the erection of transmission lines along the roads of the county. The franchise will run for fifty years and under its terms the company is to pay into the County Treasury two per cent of the gross receipts from the current passing over the lines operated under it.

TELEPHONE AND TELEGRAPH.

Los Angeles, Cal.—The Home Telephone Company will, on February 21, remove its principal office from this city to Chino.

Vallejo, Cal.—Navy yard officials announce that a wireless station is to be installed at Valdez, Alaska, in addition to the one already operating at Sitka.

Willows, Cal.—The Glenn Telephone Company, of this place, has contracted with the federal government to construct from Orland to Sites, by way of Stony Ford.

Santa Rosa, Cal.—The Rincon Valley Association has been organized at Rincon Valley, for the purpose of having a telephone line built into that section. A. Bacon is president, and L. M. Bush, secretary of the association.

Salina, Utah—The Salina Telephone Company has been organized here, to construct and operate a telephone system in this place. A franchise has already been secured. A. J. Lewis is president, and H. F. Jorgensen, secretary of the company.

Oakland, Cal.—The Home Telephone Company has applied for permission to extend its lines throughout this county. A fifty-year franchise is asked, in return for which the company offers to make a number of concessions, including free telephones for the county officials and two per cent of the gross receipts.

ELECTRIC RAILWAYS.

Stockton, Cal.—Bids will be received to February 10, for the electric street railway franchise in this city, applied for by the Central California Traction Company.

El Paso, Tex.—T. B. Enocks and others, of Kansas City, Mo., are planning to build an inter-urban electric line between this city and Las Cruces, N. M., and are to arrive here shortly to consider the details.

Pomona, Cal.—W. C. Kerchoff is securing rights of way from Upland through Claremont to North Pomona, for an electric railway, and promises that construction on this line will begin as soon as the right of way is complete.

Chehalis, Wash.—The Chehalis & Centralia Railway & Power Co. has purchased the power plant, cars, rails, etc., of a defunct California electric railroad and will move everything and install the line—ten miles—between Chehalis and Centralia.

Phoenix, Ariz.—General Agent Landis, of the Phoenix & Eastern Railroad, states that floods have made it necessary for the railroad company to build a trolley line across the Gila River, at Winkleman, for the purpose of transporting ore.

Los Angeles, Cal.—On February 1, Wells Fargo & Co. will take over the express business on the electric railway lines of the Los Angeles-Pacific system, connecting Los Angeles with Santa Monica, Ocean Park, Redondo and a number of smaller towns.

Colville, Wash.—Application has been made to the County Commissioners by A. E. Baldwin and C. J. Webb for an electric railway franchise over the highways in Stevens County between Kettle Falls and the mouth of the Spokane River. The line will be forty-five miles long.

Eugene, Ore.—A deed was filed for record at the court house January 17th, by which the formal transfer of the Eugene and Eastern Electric Railway became the property of the Portland, Eugene and Eastern Railway. It was signed by J. O. Storey as president, and E. W. Hall as secretary. The consideration is $505,400.

San Francisco, Cal.—The Parkside Transit Company has completed track-laying on its franchise from Ingleside to Thirty-third Avenue and T Street. Work will now begin on the remainder of the main line on Twentieth Avenue, from T to H Street and on the extension of the Ingleside line from Thirty-third Avenue to the beach. The company has applied for a franchise on Twentieth Avenue, from W to H Street, to be used in place of the line previously authorized on Nineteenth Avenue.

San Francisco, Cal.—John J. Egan, who is at the head of the movement to make it possible for individuals or companies to operate street cars over thirty-one blocks of a rival corporation's tracks, has filed a petition with the Election Commissioners asking that an amendment to that effect shall be voted on at the next election. At present the limit is ten blocks. In his petition Mr. Egan states that 247 miles of street railway are desired by him and his associates. The petition contained 12,000 signatures.

Minneapolis, Minn.—An Associated Press report says: Minneapolis and St. Paul are to be the eastern terminus of an electric line to run to Seattle. The company behind the project is known as the Minneapolis, St. Paul and Seattle Railway Company, with a capital of $500,000,000. Articles of incorporation were filed with the Secretary of State at Pierre, S. D. The incorporators are William C. Webster, Rochester, Minn.; David Philips, Mazeppa, Minn.; Samuel E. Phillips and James Mosep, St. Paul, and Glenn W. Martens, Pierre, S. D.

Pasadena, Cal.—Horace M. Dobbins, president of the Pasadena Cycleway Association, announces that he is now at the head of a company capitalized at $5,000,000, which purposes the construction of an electric railroad between Los Angeles and Pasadena, which will be three miles shorter than the present Short Line of the Pacific Electric Railway Company. According to Mr. Dobbins, about $2,500,000 will be spent on the building of the road. A third-rail system will be employed. It is planned to have the electric trains make the trip between the two cities in fifteen minutes.

Pendleton, Ore.—The railroad war between Harriman and Hill seems likely to give Pendleton and the western portion of Umatilla County an electric line much sooner than has been expected. The efforts of the O. R. & N. Company to block the building of a spur track to the Peacock flouring mill at Milton by the Walla Walla Traction Company has embittered this war, and the traction company, which is a feeder of the Hill lines, now declares that it will extend its lines to this city in the next two years. It also declares that it will build to every important town and city in the inland empire now touched by the O. R. & N. Company, and a genuine railroad war and campaign of traffic hunting is anticipated in this section.

ILLUMINATION.

Sausalito, Cal.—Robert P. Geer, and others of this place, have plans under way for the construction of a large gas plant to supply gas for light and fuel.

Solomonville, Ariz.—C. B. Jameson is now negotiating with the towns of Solomonville, Pima, Thatcher and Safford, for franchises for electric distributing systems. He says that he will put in a power plant, either at Thatcher or Safford.

Los Angeles, Cal.—An ordinance has been passed by the City Council ordering the necessary appliances and current for the lighting for two years, of Fourth Street, from Main to Hill.

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